AMENDMENTS TO THE CLAIMS

Please amend Claims 1, 28, 29, 31, 38, 39 and 49 as follows, and cancel Claims 8-27.

1. (Currently Amended) ~~The~~ <u>A</u> method of treating a subcutaneous histological feature within a given depth range in the human body with microwave energy comprising the steps of selecting a microwave frequency in which the loss factor of the target feature is greater than that of adjacent tissue; and directing microwave energy at the chosen frequency into the skin with a power density and for a time sufficient to raise the temperature of the target feature to a level resulting in a permanent pathological change in the target feature due to interaction of the electric field of the microwaves with the target <u>feature</u> ~~tissue~~ without resulting in a permanent pathological change in the intermediate skin.

2. (Original) The method as set forth in claim 1 above, including the step of spreading the microwave energy with a distributed energy throughout an area at the depth of the target feature.

3. (Original) The method as set forth in claim 2 above, including the further step of cooling the intermediate skin depth between the surface and the target feature during at least a portion of the treatment.

4. (Original) The method as set forth in claim 1 above, wherein the target feature comprises hair and the interaction of the electrical field of the microwaves with the hair induces preferential heating of the hair to cause permanent destruction of the follicles.

5. (Original) The method as set forth in claim 4 above, wherein the target feature comprises hair roots in the range of about 5 mm below the skin surface, and wherein the method further includes the step of controlling the intensity and duration of the microwave energy to radiate the target feature with 10 to 15 Joules of energy.

6. (Original) The method as set forth in claim 1 above, wherein the target feature comprises externally visible blood vessels of about 0.1 mm diameter or greater and within 2 mm or less of the surface, and wherein the microwave energy thromboses the blood in the target vessels by raising the blood temperature to in excess of about 55°C.

7. (Original) The method as set forth in claim 6 above, wherein the microwave frequency is in the range of 10-20 GHz, the applied energy is in the range of 20 to 30 Joules, and the duration is shorter than the thermal relaxation time of the blood vessels in the target features.

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27. (Canceled)

28. (Currently Amended) ~~The~~ A method of treating embedded blood vessels so as to cause their disappearance, comprising the steps of:

delivering areally confined wave energy in a microwave band to a target skin surface area proximate the target vessels;

distributing the confined wave energy across the selected area; and

propagating the distributed wave energy into the selected area to deliver at least approximately 10 Joules of energy in less than about one second; and

cooling the target skin surface area during at least a portion of the ~~target skin surface area~~ delivery interval period.

29. (Currently Amended) The [[A]] method as set forth in claim 28 above further including the steps of locating reticular veins in communication with the embedded blood vessels, directing the wave energy to the located reticular veins, and delivering adequate energy to the reticular veins to heat the blood therein to in excess of 70°C so as to necrose vessel tissue.

30. (Original) The method as set forth in claim 28 above, wherein the wave energy is in the frequency range of 2.45 to 18 GHz.

31. (Currently Amended) The method ~~invention~~ as set forth in claim 30 above, wherein the wave energy is in the range of 14 GHz, wherein the amount of energy delivered is in the range of 20-30 Joules, and wherein the duration of the delivery is of about 100 milliseconds.

32. (Original) The method of claim 28 above, further including the step of currently withdrawing, during propagation of wave energy to the skin surface, thermal energy from the skin surface to maintain the skin surface below a discomfort level.

33. (Original) The method of claim 32 above, wherein the step of withdrawing thermal energy comprises injecting an expanding cooling gas against the skin.

34. (Original) The method as set forth in claim 28 above, further including the steps of pre-examining the characteristics of the target area before application of wave energy, and positioning the wave energy being delivered in accordance with the pre-examined position to target chosen depths and sizes of vessels.

35. (Original) The method as set forth in claim 28, further including the steps of pretesting the dielectric and loss characteristics of the skin in a desired area, and adjusting the characteristics of the wave energy in accordance with pretest results to minimize reflected power.

36. (Original) The invention as set forth in claim 28 above, including the steps of calculating the approximate relaxation time of a target area in accordance with size, tissue character and the relaxation time, tau, expressed as $d^2/16\alpha$, wherein d is the diameter of the target and α is the thermal diffusivity.

37. (Original) The method of claim 28, further comprising the step of applying a substance from the class of substances comprising topical anesthetics and conductive substances that do not attenuate or reflect microwave energy to the skin surface.

38. (Currently Amended) ~~The~~ A method of eliminating visible skin disorders caused by visible blood flows near the skin surface, comprising the steps of:

locating target vessels further below the skin surface than the visible vessels;

directing a microwave beam toward the target vessels at a frequency that is ~~preferentially~~ absorbed by blood in comparison to surrounding skin surface and tissue; and

maintaining the microwave beam and energy level and for a time sufficient to heat blood in the reticular vessel to in excess of 70°C and cause necrosis of the vessel, thereby terminating blood flow to the vessel/veins near the surface.

39. (Currently Amended) ~~The~~ A method of permanently eliminating a subsurface telangiectasia condition comprising the steps of:

generating electromagnetic wave energy at a frequency, in the range of 2-20 GHz, which is ~~preferentially~~ absorbed by blood in relation to surrounding tissue;

propagating distributed microwave energy toward a target area of the skin facing the area of the telangiectasia condition;

maintaining the microwave energy application for a time sufficient to heat the blood in the veins having the telangiectasia to a temperature of about 70°C, such as to thermocoagulate blood in the target such that blood flow is permanently stopped;

cooling the surface layer of skin facing the area of the telangiecstasia condition at least during a part of the microwave energy application to cool the skin to a depth shallower than the telangiecstasia to prevent discomfort and surface damage without inhibiting thermocoagulation.

40. (Original) The method as set forth in claim 39 above, wherein the propagated microwave energy is the frequency range of 10-20 GHz and further including the step of establishing a field distribution within the selected target area which is greater than 25 mm^2, with an electric field strength distribution spread across the area, and wherein the exposure is in the range of 20-30 Joules.

41. (Original) The method as set forth in claim 40 above, wherein the duration of the propagated microwave energy is held for shorter than the thermal relaxation time of the veins exhibiting the telangiecstasia condition.

42. (Original) A system for applying microwave energy to a body to heat specific internal volumes under the skin of a patient to eliminate visible skin disorders, comprising the combination of:

tunable power generator means, the power generator means operating in the microwave band and including power amplifier means and means for generating energy pulses of selected duration;

an applicator head for generating a beam of microwave energy directed at the skin surface at positions selected by an operator, the applicator head including interior dielectric beam shaping means for spreading wave energy in the beam throughout a power distribution area at the skin surface; and

microwave transmission means coupling the power generator means to the applicator head.

43. (Original) A system as set forth in claim 42 above, wherein the system further includes means adjustable by an operator for tuning the power generator means within a frequency range of 2.45 to 18 GHz, and means for measuring transmitted power and reflected power.

44. (Original) A system as set forth in claim 43 above, wherein the system further includes means responsive to the power measurements for tuning the power generator to increase efficiency by reducing reflection loss.

45. (Original) The system as set forth in claim 42 above, wherein the wave transmission means comprises a flexible line allowing manipulation of the applicator head and wherein the applicator head comprises a waveguide, and the dielectric beam shaping means include at least one longitudinal element within the waveguide and having a high dielectric constant.

46. (Original) A system as set forth in claim 45 above, further including means coupled to the applicator head for cooling parts of the skin surface adjacent to the applicator head.

47. (Original) A system as set forth in claim 42 above, further including means at the applicator head for measuring the temperature of the skin surface during application.

48. (Original) A system as set forth in claim 42 above, including means for limiting pressure exerted on the skin surface during the application.

49. (Currently Amended) A system for treating subcutaneous histological target features with microwave energy to effect pathological change in such features comprising:

a source of microwave energy tunable in the range from 10-20 GHz;

a controllable element coupled to the source of microwave energy to deliver microwave energy pulses in response to control signals;

a microwave energy delivery device coupled to ~~the~~ a controllable switch and including a microwave delivery port of less than about 150 mm^2 in area;

a cooling device including a controllable flow gating element, a source of pressurized coolant, and a coolant delivery channel adjacent the microwave delivery port; and

a control system for providing control signals to operate the controllable element and the flow gating element in timed relation for selected durations.

50. (Original) A system as set forth in claim 49 above, wherein the microwave energy delivery device includes a spacer element attached to the microwave delivery port and configured to provide a standoff volume providing a gap between the port and a skin surface in the range of 0.25 to 0.75 mm in contact with the skin surface wherein the coolant delivery channel extends through the spacer element and wherein the controllable flow gating element comprises a solenoid-operated valve.

51. (Original) A system as set forth in claim 50 above, wherein the microwave energy delivery device comprises a hand-held applicator including a waveguide transition section including a wave concentrating dielectric and terminating in a microwave delivery port, and wherein the system further includes a manipulable waveguide device coupling the source of microwave energy to the hand-held applicator.

52. (Original) A device for delivering microwave energy at a skin surface for propagation into a body for therapeutic treatment comprising:

an open ended wave transmission line; and

a dielectric insert disposed in the open end of the wave transmission line, the dielectric insert being selected to match the dielectric constant of the portion of the body

into which the microwave energy is to be propagated, and configured to spread the electric field.

53. (Original) A device as set forth in claim 52 above, wherein the applicator head further includes means for cooling the skin surface.

54. (Original) A device as set forth in claim 53 above, including in addition a spacer element about the open end of the wave transmission line and configured to establish a standoff volume between the open end and the skin surface.

55. (Original) The device as set forth in claim 54 above, wherein the wave transmission means is a rectangular waveguide and the dielectric and waveguide are of reduced size for the stated frequency due to the presence of the dielectric and the dielectric comprises at least one longitudinal segment of high dielectric constant.

56. (Original) A device as set forth in claim 52 above, including further a visualizing element for allowing precise location of the applicator head relative to a target area on the skin.

57. (Original) A device as set forth in claim 52 above, wherein the dielectric insert in the applicator head further protrudes into contact with the skin surface and the head includes spring mounted means for withdrawing the dielectric into the waveguide to limit pressure on the skin surface, and the applicator head includes means for cooling the dielectric.

58. (Original) An applicator for delivery of microwave energy to a skin site, for effecting a localized change in the pathological condition of a target feature in the body adjacent the skin site, comprising:

a waveguide terminating in an areal aperture, for transmitting microwave energy outwardly through the aperture;

dielectric material in the waveguide adjacent the aperture and configured to spread field energy cross-sectionally across the area of the aperture;

a spacer element encompassing the waveguide terminating aperture for spacing the aperture from the skin site to define a standoff volume therebetween, the spacer element including at least one internal conduit communicating with the interior standoff volume; and

means coupled to the internal conduit for injecting a gaseous coolant into the standoff volume.

59. (Original) An applicator as set forth in claim 58 above, wherein the waveguide transmits microwave energy in the range of 10-20 GHz and wherein the spacer element defines a standoff volume having a height from the skin of in the range of 0.010" to 0.030".

60. (Original) An applicator as set forth in claim 59, wherein the waveguide has a converging tapered section leading to the aperture and the dielectric material is disposed along and within the tapered section and terminates at the aperture and comprises high dielectric material for microwave energy concentration and low dielectric spacer material for holding the high dielectric material in position.

61. (Original) An applicator as set forth in claim 60 above, wherein the high dielectric material comprises two substantially parallel tapered strips within the tapered section lying parallel to the electric field within the waveguide, and wherein the means coupled for injecting a coolant provides an expanded coolant gas from the class comprising 1, 1, 1, 2 tetrafluroethane and air.

62. (Original) An applicator as set forth in claim 61 above, wherein the microwave energy is at a frequency of approximately 14 GHz, and wherein the terminating aperture of the waveguide is approximately .250" × .150" and the standoff volume has a height of approximately 0.020".